ENSAFE

Environmental and Safety Designs, Inc.

901/372-7962

April 10, 1991

Ms. Beth Brown
Remedial Project Manager
U.S. Environmental Protection Agency
Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

RE: Collierville Site Sampling Plan for Soil Total Organic Carbon and TCE Degradation
          Indicators

Dear Ms. Brown:

The following sections outline soil and groundwater sampling and analysis to be performed
during RI Phase III. The first section addresses preliminary soil testing for Total Organic
Carbon (TOC) to assess the utility of a site-specific partition coefficient study. The second
section covers groundwater sampling and analysis to be performed to assess the potential
for (or occurrence of) microbial degradation of TCE based on indicator parameters.

PARTITION COEFFICIENT/SOIL ORGANIC CARBON STUDY

In order to assess the potential for contaminant migration in and through subsurface soils
at the above-referenced site, it may be necessary to determine partition coefficients for the
confirmed site constituents on a site-soil specific basis.

Any partition coefficient study must be predicated by evidence that sufficient soil organic
matter exists to make contaminant sorption (to soil organic matter) a significant contributor
to overall contaminant attenuation.

At the Carrier-Collierville, Tennessee site, there are three (3) distinct subsurface strata
which (intuitively) are considered to be the most likely areas of contaminant attenuation.
The first stratum is an area (layer) within the Terrace deposits which has been encountered
at depths ranging from 10 to 15 feet below ground surface. Elevated contaminant levels
have been previously identified in this area. The second stratum is the Terrace
deposit/Jackson Clay formation interface. This interface has been identified at varying
depths across the site. The importance of this interface in contaminant attenuation is
compounded by the fact that the contaminants of concern are DNAPLs. As a result, the
contaminants would tend to migrate through the vadose zone to this interface, and
subsequently downslope with respect to the dip of the Jackson Clay formation. An

assessment of sorption at the interface would provide insight into the contaminants ability to migrate along the Jackson Clay, and assist in determining to what extent movement is retarded by contaminant/media interactions.

The last area of concern is the Memphis Sands formation. This formation is a highly permeable sand formation, and it is used as the primary drinking water source for the municipality. The focus of the sorption study for this formation would be to determine the quantities of contaminants effectively filtered out by the formation (before introduction into potable water wells). Furthermore, sorption studies may assist in determining the overall level of remediation that may be required to ensure that said wells (and associated treatment systems) continue to produce water of acceptable quality with respect to Clean Drinking Water standards.

As stated above, the soil organic carbon content will determine whether contaminant sorption will be a significant contributor to overall contaminant attenuation. In order to assess this possibility, preliminary soil analyses will be performed. As per EPA comment, the following soil sampling plan (soil organic carbon) will be followed.

Shelby tube soil samples will be collected from each of the three (3) soil strata discussed above. These samples will be collected in accordance with the approved Site Work Plan. Please refer to the attached Site Plan for sampling locations.

The soil samples will be shipped to Pace Laboratories, Wappinger Falls, New York for analysis. All soil samples will be analyzed in accordance with Method 415.1- Total Organic Carbon as outlined in "Methods for Chemical Analysis of Water and Wastes", EMSL, Cincinnati, Ohio, March 1983. All soil containerization, shipping, preservation, labelling, and recording will be performed in accordance with the approved Site Work Plan.

Upon receipt of soil data from these analyses, standard formulae (as outlined in EPA guidance documents) will be applied to assess the potential for contaminant sorption based on soil characteristics. If the results of these calculations suggest that contaminant sorption (to soil organic matter) could be a significant means of attenuation, a draft work plan will be prepared outlining the steps to be taken to perform a site-specific soil partition coefficient study.

TCE DEGRADATION

In order to assess the occurrence of (or potential for) biodegradation of TCE in the groundwater, specific indicator parameters may be analyzed. As per EPA comment, the following indicator parameters will be monitored during the next phase of groundwater sample collection (Phase III).

Dissolved Oxygen (DO)	Method 360.1
Dissolved Organic Carbon	Method 415.1
Biochemical Oxygen Demand (BOD)	Method 405.1
Total Kjeldahl Nitrogen (TKN)	Method 351.3
Nitrates	Method 352.1
Nitrite	Method 354.1
Ammoniacal Nitrogen	Method 350.3
Phosphates (ortho-)	Method 365
Sulfates	Method 375.4
Iron (Fe), Manganese (Mn), Magnesium (Mg), and Other Dissolved Ions	EPA 6010-ICAP* (filtered)

Unless noted by an asterisk, all analyses will be performed in accordance with said methods as outlined in "Methods for Chemical Analysis of Water and Wastes", EMSL, Cincinnati, OH, March 1983. All other methods refer to USEPA SW-846. Oxidation-Reduction Potential of monitoring well samples will be determined using an ORP electrode following manufacturer's (YSI) method references.

In addition to being an indicator of sufficient carbonaceous matter for microbial activity, Dissolved Organic Carbon will also provide information pertinent to contaminant sorption. High DOC may lead to carbonaceous coating on soil particles which may in turn enhance contaminant sorption. This potential will be evaluated based on available technical documents and the assistance of Ms. Candida West, USEPA- Robert S. Kerr Laboratory, Ada, Oklahoma.

Groundwater samples will be collected from three (3) shallow and three (3) deep monitoring wells for the above-described analyses. The location of each of these wells is shown on the attached Site Plan. The rationale for selection of these wells is described below. The main criterion for selection was the wells ability to produce sufficient sample volume for the analytical methods. In addition, only wells installed by EnSafe personnel as part of the Site investigation were considered for inclusion in this study.

Monitoring well (MW) 13 was chosen due to the presence of low concentrations of both TCE and DCE indicating that limited biodegradation of TCE has possibly occurred. MW-5 was chosen due to the presence of high concentrations of TCE and DCE also indicating that biodegradation may be occurring. MW-29 was selected as a control, as no TCE or DCE has been detected in previous sampling events. These wells were chosen because they are thought to be representative of the shallow (perched) aquifer on-site. Choices were somewhat limited as numerous wells are incapable of producing sufficient sample volume.

Deep monitoring wells 1B and 4 were selected due to the presence of both TCE and DCE in previous samples. This would indicate that biodegradation may be occurring in the deep aquifer (or that previously degraded TCE/DCE have migrated to the lower aquifer). MW-16 was selected as the deep MW control location, as no TCE or DCE has been identified in samples previously collected from this location.

All monitoring well samples will be collected in accordance with sampling methods outlined in the approved Site Work Plan. Samples will be stored, shipped, labelled, and recorded following Work Plan specifications. The sample volume, preservation, and holding time requirements for the above referenced methods are provided in Table 1.

Upon collection, all groundwater samples will be shipped to Pace Laboratories, Wappinger Falls, New York for the referenced analyses (excluding field analyses).

Data will subsequently be analyzed to assess the potential for or indications of TCE degradation (and/or general microbial activity), and the general distribution of groundwater chemical parameters.

If you should have any questions or comments regarding these proposed sampling and analysis schemes, please feel free to give me a call.

Sincerely,

Mark E. Bowers
Chemist

cc: Ms. Candida West, USEPA Robert S. Kerr Laboratory
       Mr. Lee Thomas, USEPA Region IV, Groundwater Division

TABLE 1
TCE Degradation Indicator/Microbial Nutrient Parameters
Analytical Methods, and Sample Container, Volume, Preservation, and Holding Time Requirements

Method	Container	Sample Volume	Preservation	Holding Time
Dissolved Oxygen- 360.1	Plastic or Glass Beaker	500 ml. (approximate)	Not Applicable	Immediately Field Analysis
Dissolved Organic Carbon- 415.1	Polyethylene or Glass Bottle	100 ml.	Cool,4°C,pH<2 HCl or H_2SO_4	28 days
Biochemical Oxygen Demand- 405.1	Polyethylene or Glass Bottle	1 liter	Cool, 4°C	48 hours
Total Kjeldahl Nitrogen- 351.3	Polyethylene or Glass Bottle	1 liter	Cool, 4°C, pH<2 H_2SO_4	28 days
Nitrates- 352.1	Polyethylene or Glass Bottle	100 ml.	Cool, 4°C	48 hours
Nitrites- 354.1	Polyethylene or Glass Bottle	100 ml.	Cool, 4°C, pH<2 H_2SO_4	28 days
Ammonia- Nitrogen- 350.3	Polyethylene or Glass Bottle	200 ml.	Cool, 4°C, pH<2 H_2SO_4	28 days
Phosphates(ortho) 365	Polyethylene or Glass Bottle	200 ml.	Cool, 4°C, pH<2 H_2SO_4	28 days
Sulfates- 375.4	Polyethylene or Glass Bottle	250 ml.	Cool, 4°C	28 days
Iron (Fe), Manganese (Mn), Magnesium (Mg), & Other Dissolved Ions- EPA 6010-ICAP	Polyethylene Bottle	1 liter	Cool, 4°C, pH<2 HNO_3	180 days
Oxidation- Reduction Potential (YSI Meter/ORP Electrode)	Plastic or Glass Beaker	500 ml. (approximate)	Not Applicable	Immediately Field Analysis